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SWIVEL JOINT**BACKGROUND OF THE INVENTION**

This invention relates to swivel joints for use in connection with fluid lines and is particularly concerned with swivel joints which enable an attachment fitted to an end of a fluid line to be manually swivelled with respect to the fluid line and to retain the position to which it is swivelled.

There are many situations where it is desirable to have a swivelling or pivoting attachment on the end of a fixed fluid line, for instance, on the end of a water pipe. In the domestic environment, such products include shower heads, laundry faucet arms and kitchen faucet arms. Many other domestic and industrial situations also call for similar arrangements but those mentioned are the most common. Of these products, shower heads have the most prevalent problems and the present invention arises out of a desire to overcome those problems. The invention will therefore be particularly described with respect to shower heads but it is to be borne in mind that the invention is not limited to such products but has broader ramifications and applications. Such broader ramifications and applications will be readily apparent to the skilled addressee.

DESCRIPTION OF THE PRIOR ART

The most common type of shower head arrangement on the Australian market is the "all directional" shower head. This comprises an oval tablet-shaped shower head fitted to the end of a relatively long arm. The arm is pivotable through an arc with respect to a fixed water outlet protruding from the shower wall, and the head is pivotable through an arc with respect to a perpendicular housing on the opposite end of the arm. The head is also rotatable through 360° at a position adjacent to where it pivots - hence the name "all directional" shower head.

A problem with such shower head arrangements is that following repeated swivelling, either the washers between the swivelling sections wear to such an extent that leakage occurs, or the connections work loose and 5 either leakage occurs or the shower head hangs down limply. Furthermore, the design of such connections make it difficult to tighten the joints sufficiently to prevent leakage and to also orientate the shower head in the desired position.

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In an attempt to address these problems, various improvements have been devised, with the result that leakage is now reduced to some extent. However the 15 connections have not fully addressed the tendency of the head to droop after continued use or ease of adjustment.

A partial solution has been to provide a winged hex key for tightening the hinge connection nut however this has a tendency to get mislaid. A recent proposal has been to form a key integral with the connection however from 20 aesthetic considerations the key has to be small and making it small makes it difficult for women, children and the infirm to properly tighten.

OBJECT OF THE INVENTION

It is therefore an object of the present 25 invention to provide a new form of swivel joint which fully addresses the aforementioned problem and which provides an aesthetically pleasing product which can be economically produced.

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SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a swivel joint for connecting to a fluid line comprising a first member having an externally milled 35 barrel and a second member having an internally milled barrel, wherein said second member accommodates said first member in a leak-proof yet relatively rotatable relationship, and wherein the first and second members

are held together by a collar.

According to a second aspect of the invention there is provided a swivel joint for connecting to a fluid line comprising a first element having a barrel with an externally projected milled face, and a second element also having a barrel with an externally projected milled face, wherein a resiliently deformable sealing member is accommodated in one of the faces, and the first and second elements are held together in face-to-face relatively rotatable relationship by means of a collar. Preferably, the resiliently deformable sealing member is an o-ring.

The fluid line typically comprises a pipe with a rotatable attachment on one end thereof, such as the aforementioned "all directional" shower head.

DETAILED DESCRIPTION OF THE INVENTION

The milling of the barrels is perfected to a very fine tolerance to ensure that there is no possibility of leakage of fluid between them. However, to avoid the possibility of "lock up" between the surfaces due to the temperature or composition of the materials in the passaging fluid, a polymeric (for instance teflon 66®) or hydrocarbon (for instance high viscosity grease) coating can be applied to one or both of the surfaces. Such "lock up" can also be addressed in the first mentioned embodiment by including an o-ring in a recess formed in the externally milled barrel. An o-ring is however, primarily useful for providing a secondary water-tight seal as well as enabling the joint to be disassembled or "cracked" if such an occasion should arise. Preferably, both a coating and an o-ring are used when the barrels are milled from metal, such as brass. However an o-ring can be useful alone in the case where one or both of the barrels are moulded from high density

plastics material such as polytetrafluoroethylene, nylon 66®, or the like.

The barrel milled on the first member in the
5 first of the two embodiments defined above, can be either
of a cylindrical or tapered form, preferably the later.
A tapered form facilitates assembly and also enables
reseating of the barrel if necessary. The barrel milled
10 on the end of the second member will obviously have a
complementary shape to that of the first member. A major
advantage of the tapered barrel is the mechanical
advantage this gives to enable the joint to be tightened
up to a stage where it holds the arm and shower head in
any position required with relatively light forces
15 required to tighten the collar.

The barrel milled on the first member or first
element can be formed either integrally with the fluid
line/attachment or it can be fitted thereto such as by
20 means of a screw threaded connection. Preferably, it is
screw threaded to the fluid line/attachment by virtue of
an external screw thread on the end of the barrel which
mates with an internal screw thread formed in the fluid
line/attachment.

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The complementary shaped barrel on the second
member or second element can likewise be either formed
integrally with the second member or element or it can be
fitted thereto by a screw threaded or like connection.
30 Preferably it is formed integrally with the second member
or element.

The collar is suitably a cylindrically shaped
housing which holds the first and second members
35 together. Preferably it is a thumb-screw housing
enabling the two members to be tightened together to the
required relative configuration by an almost effortless
finger action. However, it can be fitted in the factory

in such a manner that finger tightening is not necessary. The former arrangement is preferred as it enables disassembly of the joint and also enables service of the joint if this should ever be necessary during the life of
5 the product.

In a preferred form of the invention, the collar includes an internal wall, offset from one end thereof, and an internal screw-thread to one side of the
10 wall. The internal wall has an opening through which an externally threaded stem on the end of the first member can extend to enable the first member to be screwed into the fluid line and retain the wall of the collar therebetween. If necessary, a fibre or plastics material
15 washer can be accommodated between the opening in the collar wall and the stem on the first member. Alternatively, or in addition, a coil spring can be located over the stem of the first member.

20 The internal screw-threaded region of the collar is adapted to connect with an external screw-threaded region on the second barrel of the second member, thereby enabling the two sections of the joint to be held together and tightened or loosened as
25 appropriate.

The swivel joint according to the invention provides a leak-proof joint which can pivot and maintain any desired position which it is pivoted to. Further, in
30 one preferred arrangement, it can be tightened by a simple finger action, thereby meeting the objects of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

35 Figure 1 is an exploded cross-sectional view of a first swivel joint according to one aspect of the present invention,

Figure 2 is an assembled cross-sectional view of the swivel joint of Figure 1,

5 Figure 3 is an assembled exterior view of the swivel joint of Figure 1,

10 Figure 4 is an exploded cross-sectional view of a second swivel joint according to a first aspect of the present invention,

15 Figure 5 is an assembled cross-sectional view of the swivel joint of Figure 4,

20 Figure 6 is an assembled exterior view of the swivel joint of Figure 4,

25 Figure 7 is an exploded cross-sectional view of a third swivel joint according to a first aspect of the present invention,

30 Figure 8 is an assembled cross-sectional view of the swivel joint of Figure 7,

35 Figure 9 is an assembled exterior view of the swivel joint of Figure 7,

40 Figure 10 is an exploded cross-sectional view of a first swivel joint according to a second aspect of the present invention,

45 Figure 11 is an assembled cross-sectional view of the swivel joint of Figure 10,

50 Figure 12 is an assembled exterior view of the swivel joint of Figure 11,

55 Figure 13 is an exploded cross-sectional view of a second swivel joint according to a second aspect of the present

invention,

Figure 14 is an assembled cross-sectional view of the swivel joint of Figure 13,

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Figure 15 is an assembled exterior view of the swivel joint of Figure 13,

Figure 16 is a side on view of two swivel joints in a
10 water line, and

Figure 17 is a plan view of the arrangement depicted in
Figure 16.

15 DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of the invention will now be described with reference to the accompanying drawings in all of which like reference numerals refer to like parts.

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Referring firstly to Figure 1, the first swivel joint comprises a first member 10, a second member 11 and a collar 12.

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~~Sub a. > The first member 10 includes an externally tapered brass barrel 13 and an externally screw-threaded stem 14 of reduced diameter. A groove 15 is formed in the lower tapered end of the brass barrel and an o-ring 16 is seated therein. The screw-threaded stem 14 screws into a complementary screw-threaded housing 26 formed on the end of an attachment 27, such as a shower head, in the water line. The taper on the barrel 13 is approximately 7° inclusive.~~

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The second member 11 includes an internally tapered surface 17 which is complementary in shape to the taper on the barrel 13. A screw thread 18 is formed on the external wall of the second member 11, and an inlet

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19 is formed integrally therewith. The internally tapered surface 17 is preferably coated with a suitable grease to prevent the first and second members locking up.

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~~Sub-arr>~~ The collar 12 comprises a cylindrical walled housing 20 with an internal transverse wall 21 towards one end thereof. The internal transverse wall 12 includes an opening 22 and there is an internal screw thread 23 on the casting which matches the external screw thread 18 on the second member. The outer surface of the collar 12 is grooved 29 (see Figure 3) to facilitate rotation by hand.

15 A plastic washer 24 locates between the collar
12 and a ledge 25 formed on the first member 10.

Figure 2 shows how the components of Figure 1 are fitted together in use. The arrangement permits rotational movement of the attachment 27 relative to the inlet 19 without loosening of the collar 12. Should, however, the attachment 27 become loose due to continued pivoting over a period of time, it can readily be tightened by simply rotating the collar 12 by slight finger pressure.

~~Sub 38~~ Figure 3 shows the external view of the swivel joint and illustrates the pleasing aesthetic appearance as well as the easily manipulable collar 29.

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Figures 4, 5 and 6 illustrate an embodiment which is very similar to Figures 1, 2 and 3 but which differs in that a spring 30 is located between the tapered brass barrel 31 and the internal wall 21 of the collar. It will also be noted that the ledge 32 on which the spring seats is lower than in the former embodiment, and there is an internal washer.

The purpose of the spring is to apply a predetermined pressure on the tapered plug/seat sufficient to maintain a continuous tightness to the joint without the need to adjust the tension via the 5 threaded collar 20. It is envisaged that this embodiment will not require the need for any adjustment at all, as this will be achieved by the spring. It can be seen that this in turn can do away with the need for the thread 23 on the collar and the thread 18 as long as the collar 10 provides a means of anchoring the collar 12 to the barrel 11 and still allow for rotation.

Figures 7, 8 and 9 illustrate a modified version of the Figures 1, 2 and 3 embodiment in which the 15 barrel 40 and the second member 41 are not tapered but are of a uniform cylindrical dimension. Thrust washers 42, 45 are included to prevent abrasive action respectively between the barrel lip 43 and the inner wall 44 of the collar and between the barrel lip 43 and the 20 seat of the barrel 41.

~~Sub a)~~ Figures 10, 11 and 12 illustrate the second aspect of the invention wherein rotation occurs about the milled end faces 50, 51 of the respective first element 25 57 and second element 53. An o-ring 54 located in a groove is formed in the end face 51 ensures that an integral seal is formed between the end faces when they are clamped together by the collar 12 as shown in Figure 11. A thrust washer is shown at 56.

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Figures 13, 14 and 15 illustrate a modification of the embodiment shown in Figures 10, 11 and 12 wherein the o-ring 60 is now located in a groove 61 formed in the end face 62 of the first element 63 rather than in the 35 end face 64 of the second element 66. A thrust washer is shown at 67.

Figures 16 and 17 illustrate a typical pivoting

shower head arrangement incorporating two swivel joints of one of the types previously described. The arrangement consists of a shower head 70 which is rotatable through 360° adjacent its head by a conventional pivoting joint 71. A first swivel joint 72 is provided adjacent the head 70 and a second swivel joint 73 is provided at the wall inlet 74. Both joints are separated by a conventional rigid arm 75 of approximately 20-30cm in length.

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Sub ar> Such an arrangement enables all directional movement of the shower head without leakage at the joints or drooping of the head. Any slight loosening which occurs following repeated and continual adjustment by the shower heads can be readily corrected by rotating the knurled collars 67 in the appropriate direction by hand.

Whilst the above has been given by way of illustrative example of the invention, many modifications and variation may be made thereto by persons skilled in the art without departing from the broad scope and ambit of the invention as herein set forth.